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Littleleaf of Pine

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Littleleaf of pine was first reported in 1934 in northwestern Alabama, and probably occurred there and elsewhere for many years before this date. It is the most serious disease of shortleaf pine in the Piedmont region of the Southeast, causing high mortality and growth reduction, and creating problems in management. Affected stands can be found from central Virginia to northeastern Mississippi, including the States of North Carolina, South Carolina, Georgia, and Alabama (fig. 1). Littleleaf also occurs in parts of eastern Tennessee and in at least one small area in southeastern Kentucky. Incidence of littleleaf is highest in Alabama and South Carolina, with Georgia ranking third.

Species Affected

Shortleaf pine is the species most seriously damaged. Loblolly pine, though also affected, is only about one-third as susceptible. A 5-year record on plots established in littleleaf stands in 5 States showed that 10 percent of the shortleaf pine died while only 3 percent of the loblolly succumbed. Littleleaf has also been reported on an occasional Virginia, pitch, slash, and longleaf pine, but, even if these reports are correct, attack on these species is too minor to have practical importance.

Symptoms

The onset of littleleaf is usually difficult to diagnose because the symptoms closely resemble those arising from mineral deficiencies of the soil, particularly low nitrogen. In the early stages of the disease, the foliage may display a slight yellowing and the current year's needles may be shorter than normal, a condition accompanied by reduction in shoot growth.

The advanced or typical stage of littleleaf is, however, readily recognized (fig. 2). The crown is sparse and ragged in appearance, and the branches, lacking the mass of normal foliage, often assume an ascending habit. The foliage appears in tufts at the twig tips as a result of progressive reduction in needle and shoot length. Needle length decreases from a normal 3 to 5 inches to only ½ to 3 inches. The foliage becomes yellow to yellow green, especially during fall and winter, and branch dying begins in the lower crown and increases. Often, sprout development of normal vigor and foliage color becomes profuse along the lower part of the main stem.

Diseased trees commonly produce abundant crops of small cones containing a high percentage of sterile seed. Littleleaf-killed trees can often be recognized by the retention of these undersized cones. A marked reduction in diameter growth is usually associated with littleleaf-afflicted trees.

Littleleaf, rarely striking trees younger than 20 years old, becomes increasingly severe in the older age classes. The disease develops rather slowly. The average typical littleleaf tree succumbs in 6 years from

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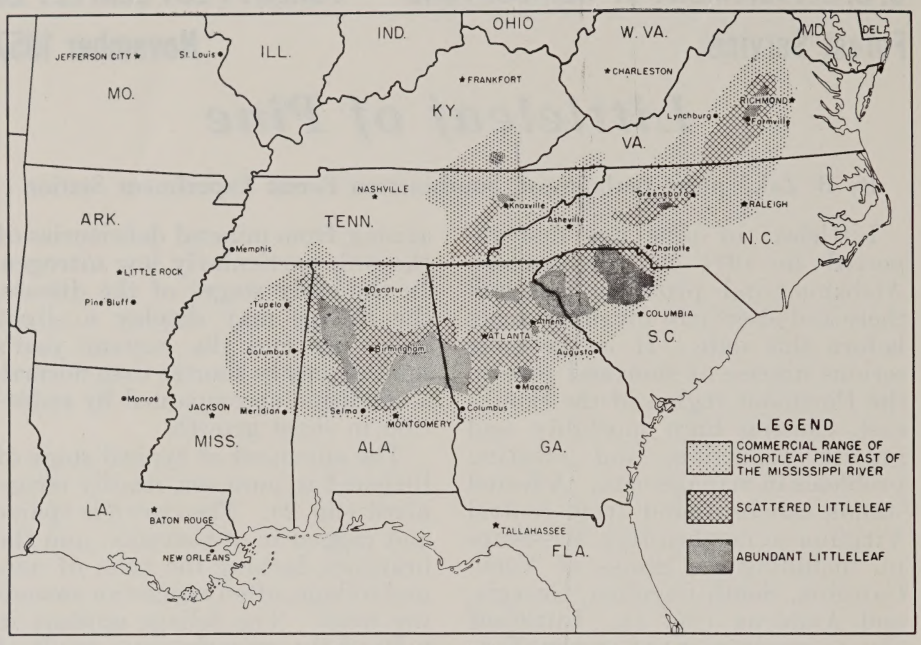

Figure 1.—Distribution of littleleaf disease of pine.

the time of first noticeable symptoms; some may die in 1 year, and yet others may persist for 12 or more years.

Economic Importance

Damage to shortleaf pine stands from littleleaf in the Piedmont region of the Southeast is considerable. About 35 percent, or about 15 million acres, of the commercial shortleaf pine area east of the Mississippi River is affected. Losses on about 5 million acres of this area are so great that the disease is a major factor in timber management.

A 1950 survey in 18 Piedmont counties, mostly in South Carolina, showed that about 13 percent of all shortleaf pine 6 inches and larger in diameter was diseased. Annual mortality of dominant and codominant trees from littleleaf on severely affected areas ranges from about 3 to 5 percent. The annual stumpage loss from littleleaf for the South as a whole has been estimated at $5,000,000.

Cause

Recent studies have demonstrated that littleleaf is the result of a combination of factors. Primary among these is the destruction of the growing tips of the roots by the soil fungus, *Phytophthora cinnamomi*. Adverse soil conditions such as poor aeration, low fertility, and periodic moisture stress reduce growth and prevent recuperation of the damaged root system. The reduction of absorbing surface of the roots retards the intake of mineral nutrients, particularly nitrogen, causing deficiencies that result in decline of the trees.

Phytophthora cinnamomi occurs widely in the Southeast, and the fungus is known to inhabit the soil in healthy as well as diseased pine stands, causing some mortality of new root tips. Littleleaf is absent on some such areas, however, because the high vigor of the trees quickly overcomes this relatively minor damage. It is only when site conditions lead to low vigor of the

Figure 2.—In the foreground are a healthy shortleaf pine on the left and typical littleleaf tree on the right.

tree that the root system deteriorates faster than it can recuperate, this deterioration resulting in the condition known as littleleaf.

Control

Losses from littleleaf in forest stands may be minimized by observance of the following simple cutting rules: (1) in stands having few diseased trees, cuts may be light and spaced at 10-year intervals; (2) in stands with 10 to 25 percent of the trees showing littleleaf, cut on a 6-year cycle, removing all diseased trees; and (3) in stands with over 25 percent of the trees showing littleleaf, cut all shortleaf pine as

soon as merchantable. But areas severely eroded in the past and subject to renewed erosion if the present cover is removed may best be left undisturbed; at most only a few trees should be removed.

Where littleleaf is causing important damage, cutting operations should be planned to favor loblolly and other pine species relatively resistant to littleleaf. Hardwoods may also be favored, and such preferences should be followed when new plantings are established.

A littleleaf hazard rating system has been developed to enable the forester to evaluate a given site easily and quickly. He can estimate the littleleaf hazard after making a few simple field measurements of soil characteristics involving internal drainage and erosion.

No practicable direct control of littleleaf in forest stands is yet available, though yard and park trees may be benefited by soil fertilizer rich in inorganic nitrogen. Tests have shown that application of 5–10–5 commercial fertilizer at the rate of 1 ton per acre, together with ½ ton of ammonium sulfate, prevents symptom development in healthy trees and improves the condition of trees in early stages of littleleaf. The fertilizer should be broadcast over the soil in the spring and the application repeated every 4 years. Disturbance of the roots by attempts to work the fertilizer into the soil should be avoided.

A program of selection and breeding shortleaf pine for resistance to this disease is under way that gives promise of ultimately providing littleleaf-resistant planting stock. In addition to littleleaf resistance, other desirable characteristics are required in the trees selected for propagation.

Soil rehabilitation is another possible long-time approach toward control of littleleaf. This soil improvement can best be achieved by employing silvicultural practices designed to increase the proportion of soil-building species such as dogwood, hickory, yellow-poplar, redbud, and redcedar, since littleleaf seldom develops in stands on superior forest soils.

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